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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : G06F 17/30 — A1

(11) International Publication Number: **WO 00/52601**

(43) International Publication Date: 8 September 2000 (08.09.00)

(21) International Application Number: PCT/US00/05328

(22) International Filing Date: 1 March 2000 (01.03.00)

(30) Priority Data:

60/122,423	2 March 1999 (02.03.99)	US
60/149,523	17 August 1999 (17.08.99)	US
09/517,013	1 March 2000 (01.03.00)	US

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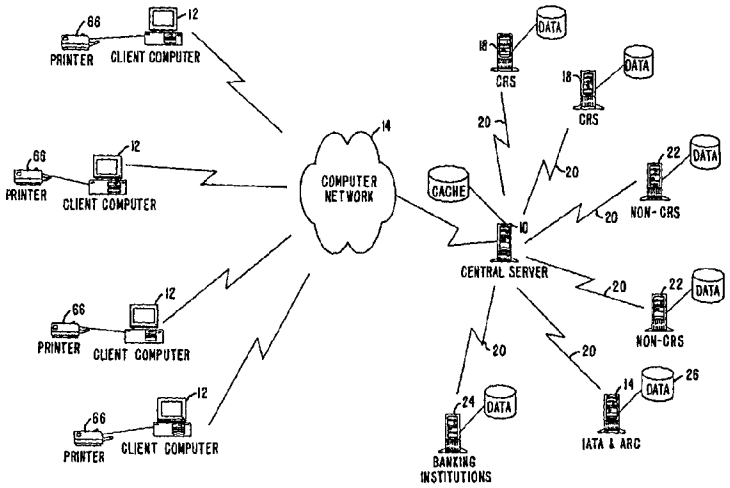
(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published

With international search report.

Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: A METHOD AND SYSTEM FOR PROVIDING TRAVEL RESERVATION AND RELATED SERVICES



(57) Abstract

The present invention relates to a method and system for providing travel reservation and related services via a computer network (16) on a dynamic and distributed basis. The present system includes a central server (10) which controls access to a number of travel service provider systems. The access control is achieved by maintaining a pool of global terminal identifiers which is assigned to a user to access a travel service provider system only when access is needed. The central server further provides a user interface which allows a user to communicate with other travel service provider systems without knowing and using any of their specific command codes. Data exchanged between the user and the travel service provider systems are automatically translated by the central server to facilitate communication. The central server further allows a user to book travel, print tickets and itineraries at any desired location, meet regulatory requirements and perform accounting tasks.

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A METHOD AND SYSTEM FOR PROVIDING TRAVEL RESERVATION AND RELATED SERVICES

CROSS-REFERENCES TO RELATED APPLICATIONS

This patent application claims the benefit of priority under 35 U.S.C. § 119 from U.S. Provisional Patent Application Serial No. 60/122,423, filed on March 2, 1999 and U.S. Provisional Patent Application Serial No. 60/149,523 filed on August 17, 1999, the disclosures of which are hereby incorporated by reference in their entirety for all purposes.

BACKGROUND OF THE INVENTION

The present invention generally relates to a method and system for providing travel reservation and related services. More specifically, the present invention relates to a method and system for providing travel reservation and related services via a computer network on a dynamic and distributed basis.

The volume of airline travel, both for business and vacation purposes, is increasing every year. In most instances, the interface between an airline and a consumer is a personal travel agency or corporate travel department. In order to make the necessary airline reservations, the travel agents generally must use the appropriate Computer Reservation System (CRS) to book these reservations. Each CRS is generally associated with a particular airline or a group of airlines. Typical CRSs include for example, APOLLO®, GALILEO®, SABRE® and WORLDSPAN®.

As the name itself indicates, the CRS is a computer system designed for handling travel reservations. The standards and protocols for implementing a CRS were first developed in the late 1960's and early 1970's. These CRS standards and protocols make use of esoteric command lines and characters, which renders them difficult to learn and use.

In addition to the less than user-friendly nature of the CRS, the general system communication architecture of a CRS renders it inaccessible to many users. Existing CRSs, due to their development and architecture are not designed to distribute information flexibly on a computer network. The CRSs are implemented on mainframe computers. Due to their inherent constraints, mainframe computers generally are not well-suited for access by a large number of users. Furthermore, only dedicated

computers, using dialup and dedicated lines, are allowed to establish a connection and communicate with the CRS. Hence, the communication links between the dedicated computers and the CRS are static and fixed. In addition, these dedicated computers are generally fixated at one location thus requiring anyone who desires to access the CRSs to travel to that location.

More specifically, under a conventional CRS configuration, when a user requires access to a CRS, a global terminal identifier ("Gtid"), or terminal address, is assigned for each connection. A Gtid is generally a 6-digit hexadecimal string and is essentially a password generated by the CRS to provide a dedicated connection to the CRS's worldwide databases. One Gtid allows a single user to have access to worldwide travel data including, but not limited to, data on CRS's databases, as well as data on all other databases connected to the CRS, thereby permitting such user to make and secure reservations for a myriad of services.

As CRSs exist today, the Gtid is often hardwired into a particular client terminal/computer creating a fixed, dedicated connection to a CRS. Such an arrangement is obviously very inefficient. First, since the Gtid is hardwired into a particular client terminal, if such terminal is idle, then the Gtid will also be idle and unavailable for use by another client terminal. Second, with the hardwiring scheme, only one particular client terminal, generally stationed in one location, may be used to access the CRS rendering access from another location impossible.

Moreover, under a conventional CRS configuration, in order to issue and print tickets, a print job can only be directed to execute at a specialized CRS printer connected to the client terminal currently handling the transaction. A print job cannot be routed to another type of printer for printing nor can it be printed at a printer located at a different location. Additionally, the specialized CRS printer is designed specifically for the CRS and is relatively difficult and costly to maintain.

But perhaps due to the CRS's well-entrenched position and the airline industry's general reluctance to replace the CRS standards and protocols, CRSs continue to exist today and do not appear to be getting replaced any time soon.

Due to the foregoing shortcomings, various systems have been proposed in an effort to make the CRSs more user friendly and efficient. For instance, U.S. Patent No. 5,237,499, which issued to Garback, on August 17, 1993, discloses a computer system for processing travel requests to a specific venue from individual members of a sponsored group. The system includes a database which contains a venue file, a group

member file, a travel policy file, and a city code file. This system requires a preset travel policy developed from a prenegotiated sponsoring organization which limits its user group. This system, however, does not render communications with the CRS more efficient and requires print jobs to be executed at specially designed printers.

Another system is disclosed in U.S. Patent No. 5,570,283 which issued to Shoolery *et al.*, on October 29, 1996. The system described therein includes a workstation, wherein the input from the workstation is translated into CRS command codes. The system also includes multiple connections to a CRS to overcome data transfer limitations specific to the airline CRS. However, the system is limited because the number of communication links between the travel agent and the central server is fixed. These fixed communication links remains idle when not in use.

U.S. Patent No. 5,781,892 which issued to Hunt *et al.*, on July 14, 1998, discloses an apparatus for interfacing with a CRS that includes a client computer and a server computer, wherein the server computer receives a command from the client computer and generates requests to the CRS. Although the method and apparatus disclosed therein allows for use of a gateway application in a client/server environment, the communication links between the travel agent and the central server is fixed, thereby making utilization of the communication links inefficient.

Moreover, U.S. Patent No. 5,839,114 which issued to Lynch *et al.*, on November 17, 1998, discloses a system having a database for storing traveler's portfolio information, business entity information, and CRS metrics data and having the capability to select an appropriate CRS for a customer. Attempts to maximize hits to booking ratio are also disclosed. However, the communication inefficiency with a CRS is not addressed.

In view of the foregoing, it would be desirable to have a travel reservation system that is capable of booking travel through a computer network by allocating communication links on a dynamic and distributed basis. Moreover, it would also be desirable to have a system that allows an agent to book travel, print tickets, print itineraries, meet regulatory requirements and perform accounting tasks. The present invention satisfies these as well as other needs.

SUMMARY OF THE INVENTION

The present invention generally relates to a method and system for providing travel reservation and related services. More specifically, the present invention

relates to a method and system for providing travel reservation and related services via a computer network on a dynamic and distributed basis. The present system includes a central server which controls access to a number of travel service provider systems. These systems include the Computer Reservation System (CRS) such as APOLLO®, GALILEO®, SABRE® and WORLDSPAN®, and other systems which are non-compatible with CRS. The access control is achieved by maintaining a pool of global terminal identifiers. A global terminal identifier is assigned to a user to access a travel service provider system only when access is needed. By utilizing a pool of global terminal identifiers, meaningful connections to the travel service provider systems are achieved on an efficient basis.

The central server further provides a user interface which allows a user to communicate with other travel service provider systems without knowing and using any of their specific command codes. Data exchanged between the user and the travel service provider systems are automatically translated by the central server to facilitate communication.

The central server also maintains a cache for storing useful information exchanged between the user and the travel service provider systems. By caching the useful information, subsequent transactions can be completed without establishing a connection to the particular travel service provider system.

The central server further allows a user to book travel, print tickets and itineraries at any desired location, meet regulatory requirements and perform accounting tasks.

Reference to the remaining portions of the specification, including the drawings and claims, will realize other features and advantages of the present invention. Further features and advantages of the present invention, as well as the structure and operation of various embodiments of the present invention, are described in detail below with respect to accompanying drawings. In the drawings, like reference numbers indicate identical or functionally similar elements.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an overall view of the system configuration of one embodiment of the present invention;

Fig. 2 is an overall view of the system configuration of an alternative embodiment of the present invention;

Fig. 3 is a simplified schematic diagram of one embodiment of the central server in accordance with the present invention;

Fig. 4 is a simplified block diagram showing the various functions of one embodiment of the central server in accordance with the present embodiment;

Fig. 5 is one embodiment of the interactive interface in accordance with the present invention; and

Fig. 6 is a flow diagram illustrating the operation of one embodiment of the present invention.

DESCRIPTION OF THE SPECIFIC EMBODIMENTS

The present invention will now be described. Referring to Fig. 1, an overall view of the system configuration of one embodiment of the present invention is provided. The system includes a central server 10, a number of client computers 12, various travel service provider systems 18, 22, and systems of the Airline Reporting Corporation (ARC) and the International Association of Travel Agents (IATA) 14 and other miscellaneous systems including systems from banking and credit card institutions 24.

The client computers 12 are capable of communicating with the central server 10 via a computer network 16. The computer network 16 can be a variety of computer networks including a worldwide computer network, an internet, the Internet, a wide area network, a local area network, an intranet, a combination thereof, and the like.

The central server 10 acts as a gateway controlling access to various travel service provider systems and other databases by the client computers 12. The details as to how the central server 10 controls access to the systems of various travel service providers and other databases will be described later below.

Many types of travel service provider systems can be linked to the central server 10 so that their type of travel (e.g. cruises, hotels, rental cars) can be offered and sold to travel agents using the system. In one embodiment of the present invention, a Computerized Reservation System (CRS) 18, such as GALILEO® is the system used by a travel service provider. The central server 10 can be linked to the CRS 18 via a number of communication links 20 including frame relay lines and a dedicated dialup line. Any

mechanism for providing secure communications between the central server 10 and the CRS 18 is contemplated in the present invention.

It is important to note that the CRS 18 is not the only type of travel service provider system that can be linked to the central server 10. Other systems and databases can be linked to the central server 10 as well. For example, many travel service providers utilize systems 22 that are not compatible with conventional CRSs. Thus, in order to provide travel agents with a greater degree of flexibility and variation in travel service options, individual companies, such as tour operators, car rental agencies, cruise operators, international airlines, and domestic airlines, each possibly having its own system, can also be directly linked to the central server 10 through dedicated or other secure connections. Through this series of linkages to various travel service provider systems 18, 22, the present system can advantageously provide travel agents with a central server 10 that can book reservations with virtually any travel service provider, even those providers that have non-CRS compatible systems.

The central server 10 can also be linked with systems of banking institutions 24, such as VISA®, MASTERCARD® or AMERICAN EXPRESS® so that credit card orders taken from travel agents on-line can be charged. It should be understood that communications between the central server 10 and the banking institutions are generally conducted across a secure data link so that the risks of having the credit card numbers and other confidential information stolen are minimized. Such secure communications can be implemented using well-known encryption techniques so that the data are encrypted according to the Secure Socket Layer, Data Encryption Standard (DES), or with software and systems from an encryption company such as RSA Data Security, Inc. (Redwood City, CA).

The central server 10 can further be linked with the systems 14 databases 26 of the Airline Reporting Corporation (ARC) and the International Association of Travel Agents (IATA). The link to the ARC 14 allows the system to automatically update the ARC databases 26 as to the number of flight segments ticket coupons sold by a particular travel agency. Such updating of the ARC databases 26 are mandated by the airlines. In addition, the link to the IATA 14 allows real time validation and authentication of a travel agency. This prevents unauthorized individuals from posing as travel agents and using false IATA numbers to book reservations on-line through the system. Once a travel agent logs into the system through the computer network 16, its IATA number can be sent to IATA 14 for verification. If its number is not found,

because it, for example, is no longer authorized to provide travel services, the central server 10 will deny it access to the various travel service provider systems 18, 22.

Furthermore, under this embodiment of the present invention, the implementation is deployed over a computer network 16, such as the Internet, and, unlike other software products, does not require a pre-installed discrete software platform. As a result, access to the CRS 18 can be made from any suitable location where the computer network 16 is accessible.

It should be further understood that the present invention also provides scalability and redundancy. In an alternative embodiment, as shown in Fig. 2, the system includes multiple central servers 10 which can offer multiple alternative routes of access to various travel provider systems and databases. The multiple central servers 10 can also communicate with one another via either a computer network 16 or a direct connection; thereby ensuring that satisfactory services can be provided to the client computers 12.

Referring now to Fig. 3, a simplified schematic diagram of one embodiment of the central server 10 in accordance with the present invention is illustrated. As shown, the central server 10 includes a series of host computers 30 that provide storage for the software and data that are needed to implement the system. The host computers 30 can be any type of computer capable of being a network server, such as the Intel Pentium II, 4-way multiprocessing computers having at least 512Mb of memory and 72Gb of RAID disk storage. In addition, each host computer 30 preferably includes a 100Mb fast Ethernet connection for communicating with other host computers and subsystems in the central server 10. These host computers are preferably configured as or connected to SQL servers and are capable of running Microsoft SQL server software or other relational database system and Internet web development tools. It should be understood that any type of computer system that has the ability to perform the functions listed herein is within the scope of the present invention.

The host computers 30 are connected through a number of serial connections to a group of data switches 32 and modems 34 whose primary function is to link the host computers 30 to a number of frame relay data lines 20. The frame relay data lines 20 provide fast data transfers from the host computers 30 to one or more Computer Reservation System (CRS) 18. It should be noted that additional frame relay data lines 20 could be added in order to provide the host computers 30 with direct access to other types of travel service provider systems. Thus, data can be securely transferred to and from the CRS 18 across the frame relay data lines 20. It should also be noted that there may be a

series of intermediary servers (not shown) at the CRS 18 that actually manage the data traffic across the direct connections. The mainframe computer that houses the data is normally protected from outside users so that the integrity of the data is maintained.

The host computers 30 can also be connected to a series of e-mail servers 36 which are capable of providing e-mail functionalities for the central server 10. For example, electronic copies of tickets could be e-mailed from a travel agent working on the system to their customers automatically once their travel plans have been booked. Alternatively, each travel agent that has signed up with the service can receive e-mail in response to advertisements. The travel agent could then respond to the e-mail, and also book any travel while they are on-line with the system. Other forms, such as confirmations, itineraries, bills and account statements, could also be e-mailed to or from the travel agent. In fact, virtually every form that can be printed on the system can be formatted to be read as an e-mail, or a graphical attachment to an e-mail.

The host computers 30 and e-mail servers 36 are linked through a 100Mb 10baseT Ethernet network to a firewall computer 38. It is well understood by a person skilled in the art that other well known topology, such as token ring networks, wireless networks, spread spectrum networks, and fiber optic networks, for networking computers also fall within the scope of the present invention.

The firewall computer 38 is in charge of controlling software that monitors and regulates access to the central server 10. The primary purpose of the firewall computer 38 is to prevent unauthorized users from gaining access to the central server 10 and booking any illegitimate travel reservations. The firewall computer 38 can run, for example, password protection software that requires any user attempting to access the central server 10 to provide an authorized username and password. In addition, the firewall computer 38 can deny access to computers from particular geographical locations. For example, if it is known that there are no users in Russia, the firewall computer 38 could deny access to every user attempting to access the central server 10 from Russia based on the Internet Protocol addresses from Russia.

Many software products are available that provide firewall features. A preferred product is one built into the router software, such as implemented with Cisco® routers. It should be understood that any software that provides the firewall features described herein is within the scope of the present invention. Such products are made, for example, by IBM, Cisco, Sun Microsystems, and Compaq.

The firewall computer 38 can be programmed and/or updated as necessary via a switch 40 connected to an internal local area network 42. In addition, the firewall computer 38 is linked through a switch 44 to a set of routers 46. The routers 46 are linked to high speed data lines that access the computer network 16, such as the Internet. For example, router 46 is linked to the Internet through a DS3 43Mb line. The second, backup router, is linked to the Internet through a set of two T1 lines from the phone company.

The functionality of the central server 10 will now be described. Referring now to Fig. 4, the central server 10 is capable of performing a number of functions. It should be understood that these functions of the central server 10 can be implemented in a variety of ways. For example, these functions can be collectively implemented within the central server 10, or they can be implemented on a modular basis with the central server 10 calling each specific module when a particular function is to be performed. Persons skilled in the art will know of other ways to implement these various functions.

One function 50 performed by the central server 10 is to control access to the various travel service provider systems and databases. As mentioned above, under conventional configurations, in order to gain access to a CRS 18, a Gtid is required for each connection. The Gtid is often hardwired into or otherwise reserved for a particular client terminal/computer 12, thereby creating a fixed, dedicated connection to the CRS 18 and, hence, not allowing another client terminal/computer 12 to share the Gtid.

Under the present invention, the central server 10 remedies the foregoing shortcoming by maintaining one or more pools of Gtids on a dynamic basis. The central server 10 dynamically allocates such pools of Gtids to achieve a higher percentage of utilization. Such dynamic allocation is performed in the following manner. For each CRS 18, the central server 10 controls and maintains a pool of Gtids needed for access to such CRS 18. In one embodiment, the maximum number of active Gtids which a user (*e.g.*, a business entity such as a travel agency) can have concurrently accessing the CRS 18 is previously determined. For example, a travel agency might pay for a certain number of Gtids based on the expected usage by its travel agents.

A travel agent can access the central server 10 via a client computer 12. In general, the travel agent is required to have a valid password to log onto the central server 10. After a successful log-on, the central server 10 then checks whether the travel agent from that travel agency is entitled to acquire a Gtid based on the maximum number of active Gtids which has been allocated to that travel agency. If so, the central server 10

then examines the pool of Gtids to determine whether there is an available Gtid to be assigned to the travel agent's client computer 12. The available Gtid is then temporarily assigned on an exclusive basis to the client computer 12 so as to allow such client computer 12 to communicate with the CRS 18. Once the travel agent no longer requires access to the CRS 18, the Gtid assigned to the client computer 12 is relinquished and released back to the pool of available Gtids for subsequent assignment and use by other client computers 12. In this manner, the percentage of Gtids being utilized for access to the CRS 18 is maximized thereby increasing the efficiency of usage.

In an alternate embodiment, an individual user using a client computer 12 can log onto the central server 10 without a password to gain access to the CRS 18. In one aspect, the central server 10 treats the individual user as if it was a travel agent. Similarly, the client computer 12 being used by the individual user is given an available Gtid so as to allow such client computer 12 to communicate with the CRS 18. However, as will be described below, an individual user logging onto the central server 10 is generally only allowed limited rights in its communication with the CRS 18.

The present invention further allows reservation transactions to be handled in a clear and simple manner. In one embodiment of the present invention, the central server 10 offers an interface function 52 by providing an interactive interface to render the display and exchange of information between the user and the CRS 18 seamless and transparent to the user. As will be described below, the information exchanged between the user and the CRS 18 is processed by the central server 10 before it is forwarded to either the user or the CRS 18. Via the interactive interface, a user is able to view information from or provide information to the CRS 18 without knowing and using any CRS command codes.

In a preferred embodiment, the interactive interface is implemented as an interactive web page in a form-format written using a Standard Generalized Markup Language (SGML), such as Hypertext Markup Language (HTML) and eXtensible Markup Language (XML). The interface can be accessed by a user using a client computer 12 via a computer network 16, such as the Internet. The interface is a user friendly application which operates on the point-and-click principle. It allows the user to make intelligent queries and provides graphical responses for the user to view and understand. Since the interface is deployed over the Internet, it does not require a user to have a dedicated connection. The information exchanged between the user using the client computer 12 and the central server 10 is preferably transmitted on a secure link

across the Internet. The secure link across the Internet is implemented using the secure socket layer or virtual private network, both of which offer data encryption capability. Those skilled in the art will know of other secure links suitable for use in the present invention. One example of a web page screen for entering data as a travel reservation is shown in Fig. 5. This reservation input screen would be used to make an airline reservation for a departure from Los Angeles on January 1, 1999 to New York, with a return on January 8, 1999. There is one traveler, and the option for reserving a car or hotel has not been indicated.

In another embodiment of the present invention, the interactive interface is implemented as an "emulation window" accessible to the user. The emulation window appears to the user as a conventional CRS screen, which is character based and has little or no graphics. However, in reality, the emulation window is a text window within a web page. The emulation window is useful, for example, in order to provide a user with access to a CRS in the format that the user has become accustomed to. Users can provide information via this window and receive responses just as if they were linked to the CRS 18 under prior conventional methods.

In another aspect, the interactive interface can be configured in accordance with the status of a user. Different information can be displayed or made available to different users. For example, an individual user may only be allowed to handle certain general transactions with the CRS 18; on the other hand, a user who is a travel agent belonging to a particular travel agency may be authorized to handle general transactions as well as specific transactions peculiar to that particular travel agency.

Another function 54 performed by the central server 10 is to process the information exchanged between the user and the CRS before such information is forwarded to its destination. For example, upon capturing the information provided by the user via the interactive interface, the central server 10 translates the captured information into a format that can be understood by a conventional CRS 18. The translated information is then sent to the CRS 18 for further processing. The CRS 18 does not require any special software for reading the translated information from the central server 10. The CRS 18 receives the translated information just as if it had been typed by a user accessing the CRS 18 under prior conventional methods. Once the CRS 18 processes the translated information, any necessary response is sent from the CRS 18 to the central server 10. The response from the CRS 18 is then translated by the central server 10 into a format displayable via the interactive interface. The formatted response

preferably includes all of the codes that are important to the user for booking reservations. For example, if the reservation is for an airline, the fare type, price, travel dates and type of airplane can be displayed on the web page to the user.

For instance, if the interactive interface is implemented as a web page, the response received from the CRS is translated into hypertext using, for example, HTML and XML. In the alternative, in order to provide the CRS emulation window through the Internet, a text window can optionally be displayed to the user. The data stream coming from the CRS 18 to the central server 10 is translated into standard text characters that are thereafter formatted and printed in the text window so that they appear to be in a CRS display. Once the user enters conventional CRS command codes into the text window, that newly entered data are sent to the central server 10 through the Internet. The central server 10 then reformats the text data into the appropriate command code format for the CRS and forwards those codes to the CRS 18. Once a response is received from the CRS 18, the response is similarly converted into text to be displayed in the emulation window and then is sent across the Internet to the text window on the web page displayed on the user's client computer 12.

From the user's perspective, the transaction is quick and simple. A form was filled out on-line, and a reservation confirmation was returned by the system. The user is no longer required to learn all of the complicated CRS command codes since the central server 10 is capable of converting the information provided via the interactive web page into CRS command codes in real-time for the user.

It should be understood that the present invention is not limited to providing an interactive interface only for CRSs 18. Various interactive interfaces in different formats could be displayed to the user depending on the type of reservation being made by the user and the type of system being accessed. For example, a user could choose to reserve a cruise in an interactive interface that has been formatted specifically to emulate the type of display provided directly from a non-CRS system of the cruise operator.

One advantage of the system is that data are provided to users as web pages on the central server 10. It should be noted that it is possible to host web sites on the central server 10 for travel agencies that wish to promote their own Internet related travel service. For example, the ACME travel agency could have an Internet site hosted within the central server. The ACME travel agency would then advertise its Internet site and offer special discounts or packages only available to their retail or corporate

customers. Through a password protected menu, customers of the ACME travel agency could be allowed to access ACME travel agency's web site and book travel reservations or review their itineraries. Any travel that was booked would be credited to the ACME travel agency, and tracked through the system as if it was made by a travel agent of the ACME travel agency.

In another aspect of the present invention, in order to speed up the data transfer rate between the central server 10 and the client computer 12 displaying the interactive interface, the bandwidth requirement is minimized to allow for high speed query and responses. To achieve this bandwidth minimization, a client/server architecture is used. The client computer 12 pre-processes the data provided via the interactive interface prior to delivering it to the central server 10 via the computer network 16 by condensing and encapsulating such data into smaller data packets. Similarly, data retrieved from the CRS 18 and to be delivered to the client computer 12 are first pre-processed by the central server 10 into smaller data packets. These smaller data packets are then transmitted to the client computer 12 via the computer network 16. The client computer 12 then processes these packets and expands them into an appropriate format for display.

In another aspect, the present invention reduces the time for completing a reservation transaction by providing a cache storage function 56. In order to speed up the time for completing a reservation on-line, the central server 10 can retrieve, retain and cache certain information by anticipating what is likely to be requested by the user in the near future. For example, if a travel agent books a flight from Los Angeles to New York on January 1, 1999 with a return on January 8, 1999, the central server 10 can automatically download and store all of the return flights from New York on January 8, 1999 that are in the same fare class as booked on the outbound flight. This saves a tremendous amount of time since it is very likely that the travel agent will book a return flight in the same class as the outbound flight.

In addition, the central server 10 can use the cache to store the names, addresses and preferences for each of the user's customers and build a Passenger Number Record (PNR). When another reservation for that customer need to be booked, the user only needs to select the name of the traveler from the cache, and the PNR for that customer is automatically retrieved from the cache. This saves the user from having to retype information for each customer every time that customer books a reservation. It should be understood that the cache for storing the necessary information is typically

implemented in the form of a database or a group of related databases and that the cache can reside on the central server 10 or at some external location . The implementation of such databases is well within the skills of a person of ordinary skills in the art.

Since the cache derives its information from separate external databases, the central server 10 contains the logic that merges information from these separate databases according to certain predetermined processing rules needed to create a single unified set of information. A set of business rules is provided for each CRS 18, and information is validated and then merged automatically into the cache unless there are exceptions. Generally, exceptions occur because of changes in policy by the issuing carriers or inconsistent data. When exceptions occur, the information is further processed and are usually resolved using business integrity rules mandated by the airline industry and followed by travel agencies.

The internal structure of the cache is developed through an extensive study of the data elements and data models required to meet the needs of the various travel service provider systems. The cache contains all the information necessary to produce tickets and create accounting transactions required for business operations and much additional information for supporting management functions.

The cache preferably is organized based on a point of sale model for business activity. Each travel transaction is an order. For example, airline travel, or insurance, results in a sale of a service/product from a travel service provider. When customers plan trips they generally have more than one order in mind and the trip may require bookings from several sources. The cache is preferably designed based on this intuitive model by organizing orders into "trips" which allow the support of complex travel transactions, and correspond to what customers are buying.

A simple trip can include one flight leg or the purchase of a complete tour package. A complex trip can consist of group travel for many individuals in many forms of transportation, each of which is an order. Orders are further detailed with "itineraries," such as legs of travel on airline tickets which may be individually controlled by vouchers or coupons. Each of these levels (trips, orders, itineraries) has a basic structure which is extendible by a linked list implementable by using relational database techniques.

In yet another aspect, the present invention provides a printing function 58 which allows a user to direct a print job for printing or queuing to a specified location of choice. By using information from the cache, a print job can be directed by the central server 10 to print at any desired location. The implementation is achieved via a

Windows platform software application which can either select a printer type or, alternatively, detect a specific printer. Essentially, a print image from the CRS 18 is sent to the central server 10. The central server 10 stores the print image in the cache and, when needed, reroutes the print image to a printer 66 attached to the designated client computer 12 for printing. A variety of printers can be used ranging from expensive high-end printers to low-end ASCII printers. A user also has a number of options in deciding how to execute a certain print job. A print job can be selected and executed through the use of a graphical interface or a print job can be executed unconditionally from a print queue or as generated.

In still yet another aspect, the present invention optionally provides an interactive agent reporting (IAR) function 60. The Airline Reporting Corporation (ARC) handles ticket processing and financial settlement between tens of thousands of travel agencies in the United States and the hundreds of passenger airlines in operation. ARC imposes processing and reporting requirements for each agency and thus, each week ARC processes millions of passenger tickets. In order to process these transactions, ARC requires each agency to submit a weekly report. This weekly "ARC report" from each agency is a very tedious, time intensive document to prepare.

The IAR module simplifies this regulatory requirement and generates the ARC report automatically. In operation, once the travel agency has accepted a payment from a traveler on the system, an accounting database, which can be a part of the cache, is updated by the central server 10. For example, the central server 10 can maintain a database of all airline transactions from each travel agency making reservations through the system. The IAR module generates the ARC report automatically by capturing and storing each flight segment booked by each travel agency. At any time, a travel agency can request and print out its ARC report. The travel agency simply prints the ARC report on its local printer and thereafter sends it to ARC. The IAR module opens two simultaneous connections, one with ARC 14 and one with the CRS 18, and as changes are made in one, it automatically records changes in the other.

The IAR module of the present invention eliminates the CRS terminal that is required for current IAR. Moreover, the IAR module is a secure environment that allows multiple access to the data and allows travel agents to review, modify, correct, do MCO/LTA/exchanges, or delete data. The high data integrity produced by the IAR module reduces error adjustments and lowers costs for travel agency. In addition, the IAR module provides travel agencies with access to timely, accurate information.

Agencies can determine their cash positions at all times throughout the week. Travel agencies can also use the IAR module to validate the previous day's sales, validate data and do online data correction.

In certain aspects, the IAR module is fully integrated with the travel agency's accounting system on a real-time basis. The modular technology enables automatic mathematical computations as well as real time on-line help and data checking. This results in higher productivity, fewer errors, and lower client cost. The IAR module complies with ARC protocol and procedures and automatically maintains the total fare for the traveler and computes taxes in real time from published tables.

In certain other aspects, the IAR module incorporates Passing Facility Charges ("PFC") into the reporting. These charges are derived from a variety of sources including for example, tax tables, city location, and specific airport.

In still yet another aspect, the present invention provides a fully integrated accounting function 62 that automatically receives information from the CRS 18 at the time of ticketing or at the time when the travel revenue is considered recognized. The accounting module performs accounting, according to ARC, Bank Settlement Plan ("BSP") or Direct Form of Payment ("DFOP") accounting rules for revenue reporting, bank account management, *etc.* The accounting module optionally supports various ticket/travel payment options including, but not limited to, credit cards, advance payment deposits, deposits for vendors and cash.

In other aspects, the accounting module also contributes to the compilation of the required ARC, BSP, or DFOP reports. These reports can be generated in any format, for any period in the past as well as the present operating periods. In addition, test reports can be created prior to the issue of the final report. Electronic reporting and e-mail reporting are fully supported.

In still other aspects, the accounting module provides multiple customized invoice formats. Invoices can be prepared for individual tour travel and for corporate summaries. Moreover, the accounting module fully supports commission accounting. Travel agencies earn their revenue through commissions. Commission accounting of the accounting module automates this function by performing both tracking functions and revenue accounting functions. Terms can be set for each travel agency. Commission accounting can be performed for the individual agency and can automatically enter data into the payroll system.

Travel agency accounting has unique requirements because of the various ways that tickets and other travel products are sold. The accounting module accommodates these requirements including Bank Settlement Plan and advance deposits for travel vendors. The accounting module can accommodate a large number of vendors with different payment terms and requirements. Moreover, the accounting module supports credit card transactions as well as "true accounts receivable," wherein the money is owed directly by the customer to the travel agency. Corporate and individual accounts can be established for frequent customers. Trust accounts used for advanced deposits are completely separated from accounts receivable. A full set of aging reports is optionally available.

In addition, the accounting module of the present invention provides flexible cash receipts and tracking system, that allows transactions involving cash to be restricted to a limited number of employees. One or more bank accounts can be established, including the bank account for the BSP reporting.

In yet other aspects, a general ledger that is designed for the accounting needs of a travel agency is provided, including all the features that are needed to run the non-travel part of the business. The general ledger follows recommended ASTA guidelines for an agency account. A full set of accounting controls are supported so that ledger information is always easy to audit. Accounts can be run daily, weekly, monthly or on as-needed basis. The accounting module further provides standard financial reports including, but not limited to, balance sheets, income statements, budgets, payables, receivables, and aging reports. The foregoing reports can be run at any time to give a complete picture of the business.

Moreover the accounting module has been configured to accommodate the fact that certain travel agency offices can be part of larger agencies or corporations. To simplify financial reporting, the accounting module optionally supports a variety of standard consolidation structures, which meet most travel corporation organizations. Consolidation can be performed automatically as part of the accounting period closure or strictly for *pro forma* reporting purposes.

In still another aspect of the present invention, the central server 10 can build an entire itinerary for a traveler by using data from various databases. To create the itinerary, the travel agent first books, for example, an airline flight to Los Angeles departing on January 1, 1999 and returning on January 8, 1999. If the travel agent then requests a booking for a rental car, the central server 10 will bring up the rental cars

available in Los Angeles airport for pickup on January 1, 1999 and returning on January 8, 1999. Since the data relating to the airplane flight are known, the central server is able to select the Los Angeles location and the January 1, 1999 and January 8, 1999 dates automatically for the rental car reservation. The travel agent could override these dates and destination if the traveler did not wish to book a reservation in Los Angeles for these dates. By having access to various databases, both CRSs 18 or otherwise, the central server 10 is able to save travel agents a tremendous amount of time in building an itinerary for a customer.

Fig. 6 is a flow diagram illustrating the operation of one embodiment of the present invention. At step 100, a travel agent at a travel agency contacts the central server 10 via his client computer 12 and accesses the interactive interface. The interactive interface is preferably a series of web pages which provide a number of easy-to-understand HTML form-based pages that can be used to enter travel information. Via the web pages, the travel agent signs onto the central server 10 using a predetermined password and other identifying information. At the same time, the travel agent also enters the necessary information to book a reservation for an airline ticket for its customer.

At step 120, the information entered by the travel agent is authenticated by the central server 10 to determine whether the travel agent is an authorized user and whether the forwarded information is accurate and complete for booking travel reservations. Authentication can be performed using data from the cache maintained by the central server 10.

At step 140, all the data provided by the travel agent relating to the reservation are then stored in the cache. Instructions are then run to convert the stored data into commands and codes that are readable by the intended travel provider system, such as the CRS 18. These instructions can be in any well-known software language such as Visual Basic, C, C++, JAVA or any other similar computer language.

At step 160, the commands and codes are sent to the CRS 18 across a secure data line. The CRS 18 accepts such commands and codes and then performs the necessary operations.

At step 180, data from the CRS 18 are sent to the central server 10. The data are then translated into a format which can be displayed via the interactive interface. In one embodiment, the data are translated into a HTML format so as to allow them to be interpreted by the browser and displayed to the travel agent on a web page.

At step 200, once the travel agent has booked and confirmed the reservation, all the information relating to the reservation is entered into a passenger number record (PNR)/accounting database. This database stores all confirmed travel reservation and mirrors the reservation that is made and confirmed with the CRS 18. In addition, the database contains instructions for storing not only the specific travel information relating to the passenger, but also other information, such as particular CRS computer codes that relate to accessing the reservation at a later time for processing. It should be understood that the PNR/accounting database stores a copy of virtually all of the travel information that is booked with the CRS 18. In this manner, simple lookups of travel information can be performed after the travel is booked without accessing the CRS 18. For example, if an airline reservation for John Doe has been made, the travel agent can recall that reservation at any time without having to connect to the CRS 18.

Subsequently, when the travel agent indicates that a traveler has paid for a ticket, the central server 10 logs that payment into the PNR/accounting database. This automatic entry into a general ledger for the travel agency makes accounting for sales very easy. Reports can be printed from the PNR/accounting database that show how many reservations were made by each agency, and the total amount of sales per agency, per agent, and even per traveler. Thus, travel agencies can quickly and efficiently track their sales for any period of time.

In addition, since the PNR/accounting database stores what type of sale was made, calculations of commissions due to each travel agency from the travel service providers are also stored. Consequently, reports listing the amount of commissions due per agency, per agent, or from any particular traveler, can also be printed.

At step 220, once a reservation is confirmed and paid for, tickets can be printed and issued. Furthermore, records of actual tickets purchased for each traveler can be stored in the cache. These records can be arranged by travelers from each travel agency and agent so that individual printed lists can be sent to the travel agency to list their travelers and numbers of tickets sold. These records can also be used to quickly and efficiently produce the required ARC report that lists all airline tickets sold by the travel agency.

It is understood that the examples and embodiments described herein are for illustrative purposes only and that various modifications or changes in light thereof will be suggested to persons skilled in the art and are to be included within the spirit and purview of this application and scope of the appended claims. All publications, patents,

and patent applications cited herein are hereby incorporated by reference for all purposes in their entirety.

WHAT IS CLAIMED IS:

1. A system for providing travel reservation and related services, comprising:

a user interface for communicating with a plurality of users and exchanging information with said plurality of users; and

a central processor including:

a cache for storing said information;

a ticket processor for issuing and printing tickets;

a CRS gateway for controlling access to a Computer Reservation System (CRS);

an accounting module for performing accounting functions; and

a compliance module for reconciling and reporting transactions handled by said central processor in accordance with ARC requirements.

2. A system according to claim 1, wherein a user accesses said user interface via a user computer.

3. A system according to claim 2, wherein said user interface is one or a series of web pages.

4. A system according to claim 2, wherein said user interface is configurable depending on identity of said user.

5. A system according to claim 2, wherein said user computer communicates with said central processor via a computer network.

6. A system according to claim 5, wherein said computer network is the Internet.

7. A system according to claim 1, wherein said central processor further includes a pool of global terminal identifiers.

8. A system according to claim 7, wherein communication between the CRS and said user computer requires a global terminal identifier.

9. A system according to claim 8, wherein said CRS gateway dynamically assigns an available global terminal identifier from said pool of global terminal identifiers to said user computer when communication with the CRS is needed.

10. A system according to claim 1, wherein said user interface enables a user to communicate with the CRS without using CRS command codes.

11. A system according to claim 1, wherein said stored information can be used for subsequent transactions without having to contact the CRS every time information from a user is needed.

12. A system according to claim 1, wherein information for printing said tickets can be distributed to one or more printers not directly connected to a computer being used by a user to access the CRS and said tickets can be printed by said printers at one or more remote locations.

13. A system according to claim 12, wherein said printers are standard printers which are capable of handling non-CRS print jobs.

14. A system according to claim 12, wherein said information for printing each of said tickets includes a ticket image and information that is compliant with security standards and requirements established by IATA.

15. A system according to claim 14, wherein said information for printing said tickets is encrypted.

16. A system according to claim 15, wherein said encryption is implemented using data encryption standard (DES).

17. A system according to claim 1, wherein said cache is implemented using relational database techniques.

18. A system for providing travel reservation and related services, comprising:

a plurality of clients;

a central server accessible to said plurality of clients; and

a reservation server having reservation information accessible therefrom;

wherein said central server acts as a gateway to control access to said reservation server by said plurality of clients;

wherein said central server maintains a pool of global terminal identifiers;

wherein a client is permitted to communicate with said reservation server only if said client possesses a global terminal identifier; and

wherein said central server dynamically assigns an available global terminal identifier from said pool of global terminal identifiers to a client which desires to communicate with said reservation server.

19. A system according to claim 18, further comprising:

two or more of said central server; and

two or more of said reservation server;

wherein each central server acts as a gateway to control access to two or more of said reservation server.

20. A system according to claim 18, wherein said reservation server is a Computer Reservation System (CRS).

21. A system according to claim 20, wherein said Computer Reservation System (CRS) is a member selected from a group consisting of APOLLO® reservation system, GALILEO® reservation system, SABRE® reservation system and WORLDSPAN® reservation system.

22. A system according to claim 18, wherein said reservation server is a non-Computer Reservation System (CRS).

23. A system according to claim 18, wherein said plurality of clients communicate with said central server via a computer network.

24. A system according to claim 23, wherein said computer network is the Internet.

25. A system according to claim 18, wherein said central server communicates with said reservation server via frame relay lines.

26. A system according to claim 18, further comprising an interactive user interface to permit exchange of information between said plurality of users and said reservation server.

27. A system according to claim 18, further comprising a cache for storing said information exchanged between said plurality of users and said reservation server.

28. A system according to claim 18, wherein one client, via said central server, is capable of directing a ticket to be printed at a printer coupled to another client located at a remote location.

29. A system according to claim 26, wherein said interactive user interface is a web page.

30. A system according to claim 26, wherein said interactive client interface is an emulation window that emulates a display of the Computerized Reservation System (CRS).

31. A system according to claim 18, wherein information received from a client is translated into a format understandable by said reservation server.

32. A system according to claim 18, further comprising an interactive agency reporting module.

33. A system according to claim 18, further comprising an accounting module.

34. A system according to claim 18, wherein at least one of said travel reservation and related services is a member selected from a group consisting of a car rental agency, a tour operator, a cruise operator, a hotel operator, a trip operator and an airline.

35. A system for providing travel reservation and related services, comprising:

a plurality of clients;

a plurality of gateway servers;

a plurality of reservation servers;

wherein each of said plurality of gateway servers controls access to one or more of said plurality of reservation servers;

wherein each of said plurality of gateway servers maintains a pool of global terminal identifiers for each of said plurality of reservation servers;

wherein a client is authorized to communicate with each of said plurality of reservation servers only if said client has been assigned a global terminal identifier; and

wherein each of said plurality of gateway servers dynamically assigns an available global terminal identifier from said pool of global terminal identifiers to a client which desires to communicate with one of said plurality of reservation servers.

36. A system according to claim 35, wherein if a first gateway server is unable to provide access to a particular reservation server, clients desiring to communicate with said particular reservation server are re-routed by said first gateway server to a second gateway server capable of providing access to said particular reservation server.

37. A method for providing travel reservation and related services, said method comprising:

establishing a connection to a central server which controls access to a reservation server;

establishing a dynamic connection to said reservation server via said central server;

communicating with said reservation server to procure desired travel reservation and related services; and

printing out reservation information at any one of a plurality of remote locations.

38. A method according to claim 37, wherein said central server maintains one or more global terminal identifiers; and

wherein said reservation server can only be accessed with one of said global terminal identifiers.

39. A method according to claim 37, wherein establishing said dynamic connection further includes acquiring an available global terminal identifier from said central server to permit access to said reservation server.

40. A method according to claim 37, wherein communicating with said reservation server further includes providing user information via an interactive user interface.

41. A method according to claim 40, wherein said interactive user interface is a web page.

42. A method according to claim 37, wherein said reservation information includes a ticket.

43. A system for providing travel reservation and related services, comprising:

means for establishing a connection to a central server which controls access to a reservation server;

means for establishing a dynamic connection to said reservation server via said central server;

means for communicating with said reservation server to procure desired travel reservation and related services; and

means for printing out reservation information at any one of a plurality of remote locations.

44. A system according to claim 43, wherein said central server maintains one or more global terminal identifiers; and

wherein said reservation server can only be accessed with one of said global terminal identifiers.

45. A system according to claim 43, wherein said means for establishing said dynamic connection further includes means for acquiring an available global terminal identifier from said central server to permit access to said reservation server.

46. A system according to claim 43, wherein means for communicating with said reservation server further includes an interactive web page.

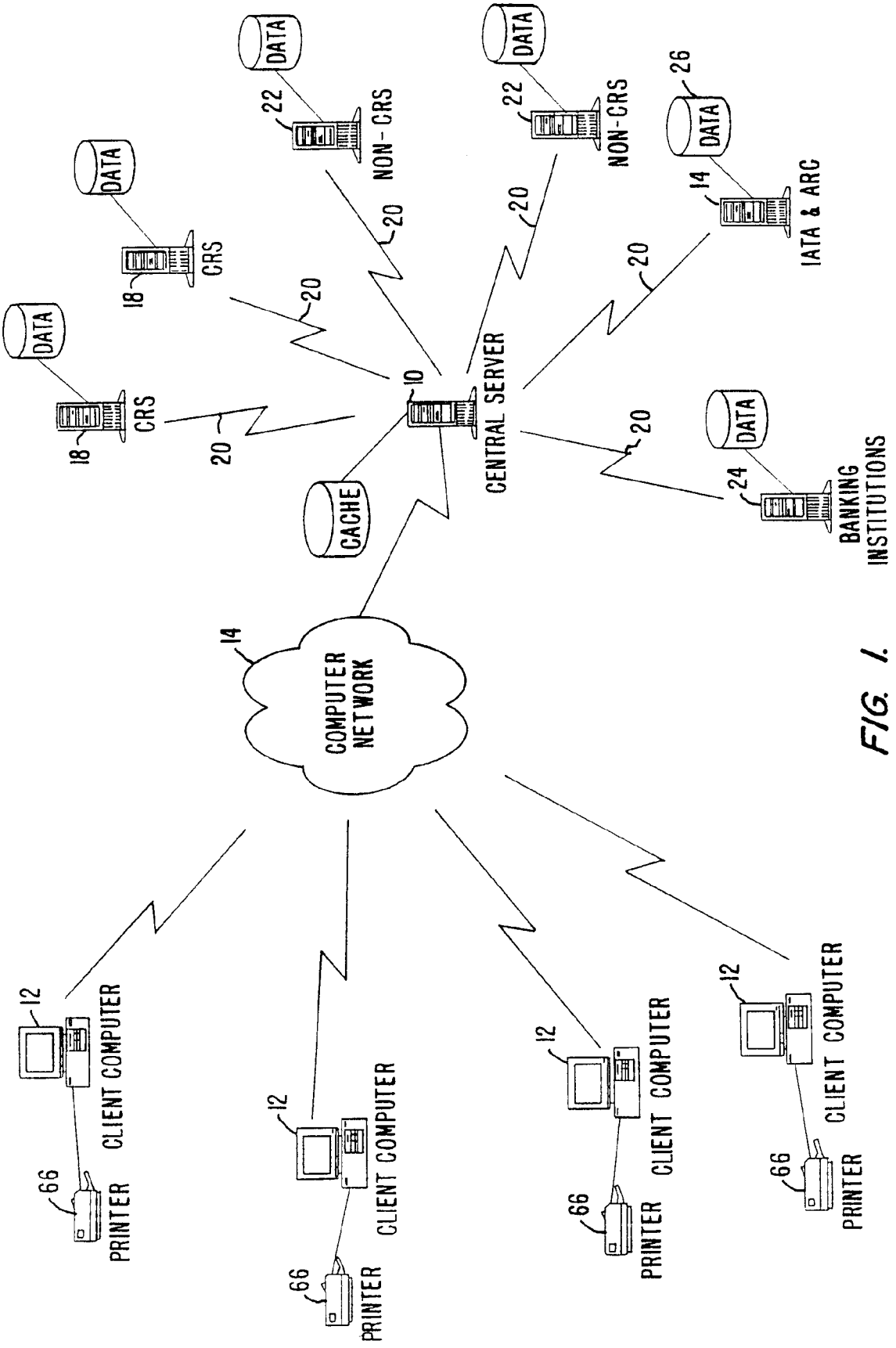
DATA
22
NON-CRS
DATA
22
NON-CRS
DATA
26
DATA
14
IATA & ARC
DATA
18
CRS
DATA
18
CRS
20
20
20
20
20
10
CENTRAL SERVER
CACHE
DATA
24
BANKING INSTITUTIONS
14
COMPUTER NETWORK
12
CLIENT COMPUTER
66
PRINTER
12
CLIENT COMPUTER
66
PRINTER
12
CLIENT COMPUTER
66
PRINTER
12
CLIENT COMPUTER
66
PRINTER

FIG. 1.

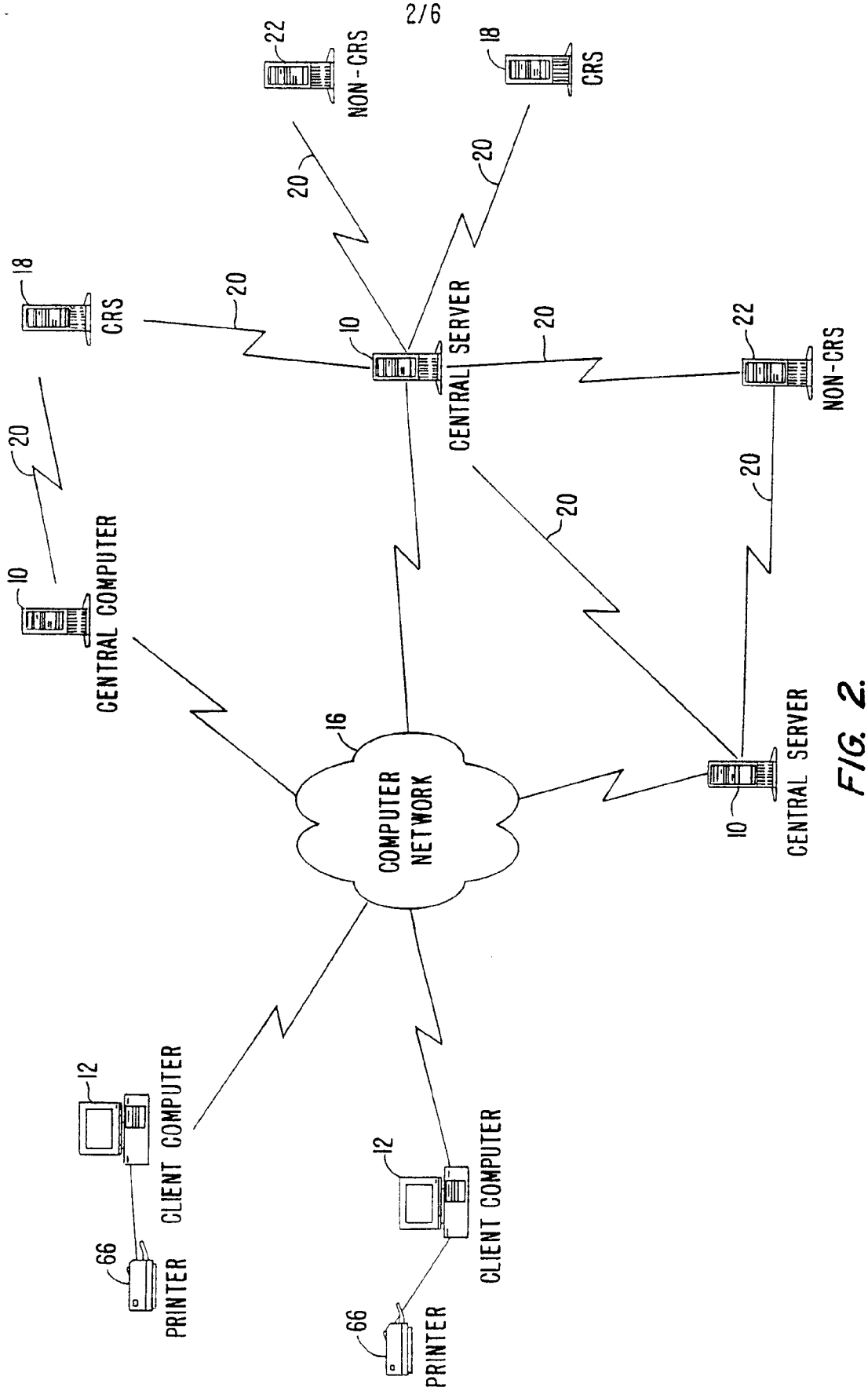
22
NON-CRS
18
CRS
20
20
18
CRS
20
10
CENTRAL SERVER
20
22
NON-CRS
20
20
20
10
CENTRAL COMPUTER
16
COMPUTER NETWORK
10
CENTRAL SERVER
12
CLIENT COMPUTER
66
PRINTER
12
CLIENT COMPUTER
66
PRINTER

FIG. 2.

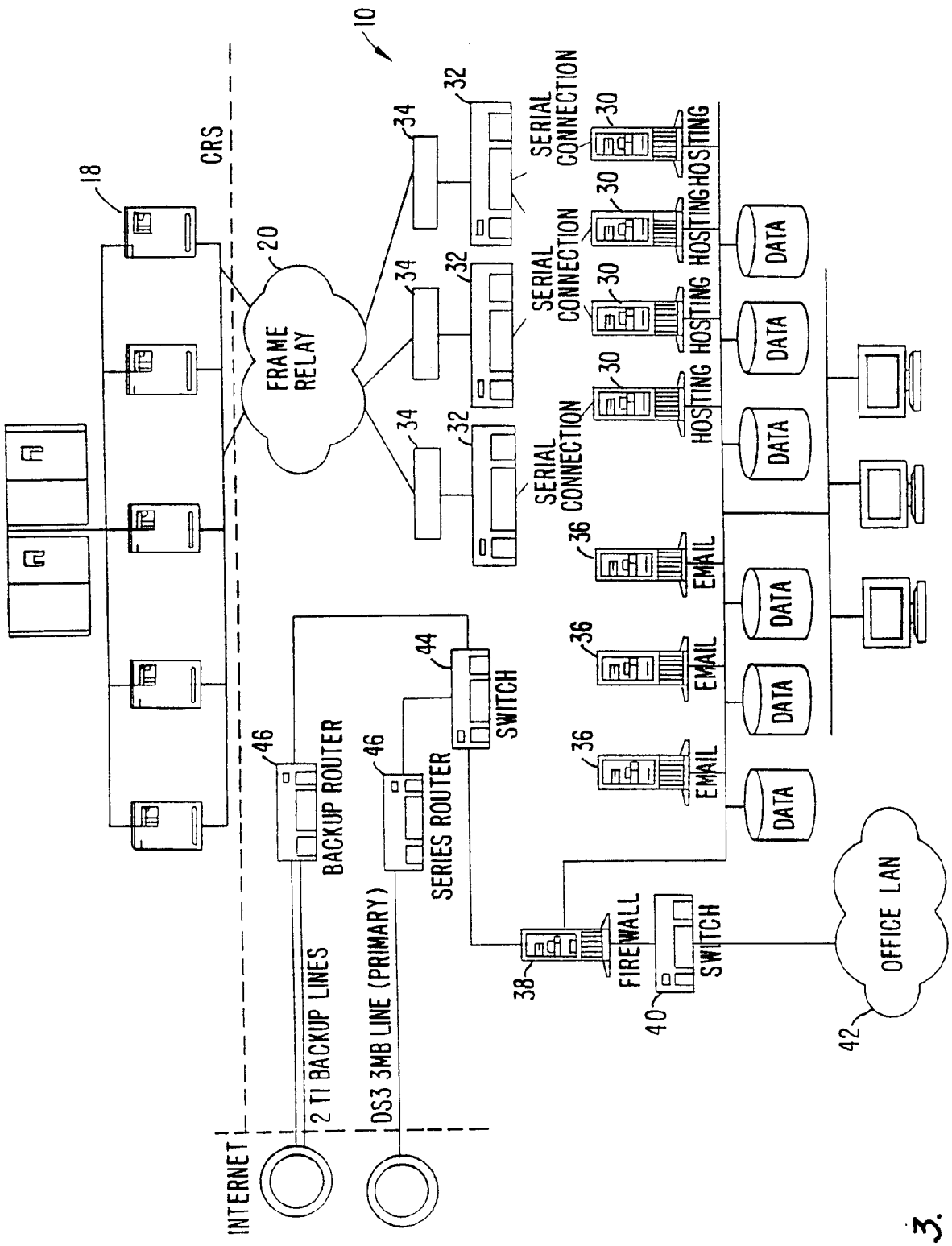
10
CRS
18
20
FRAME RELAY
32
34
SERIAL CONNECTION
30
HOSTING
DATA
36
EMAIL
44
SWITCH
46
BACKUP ROUTER
SERIES ROUTER
2 T1 BACKUP LINES
DS3 3MB LINE (PRIMARY)
INTERNET
38
FIREWALL
40
SWITCH
42
OFFICE LAN

FIG. 3.

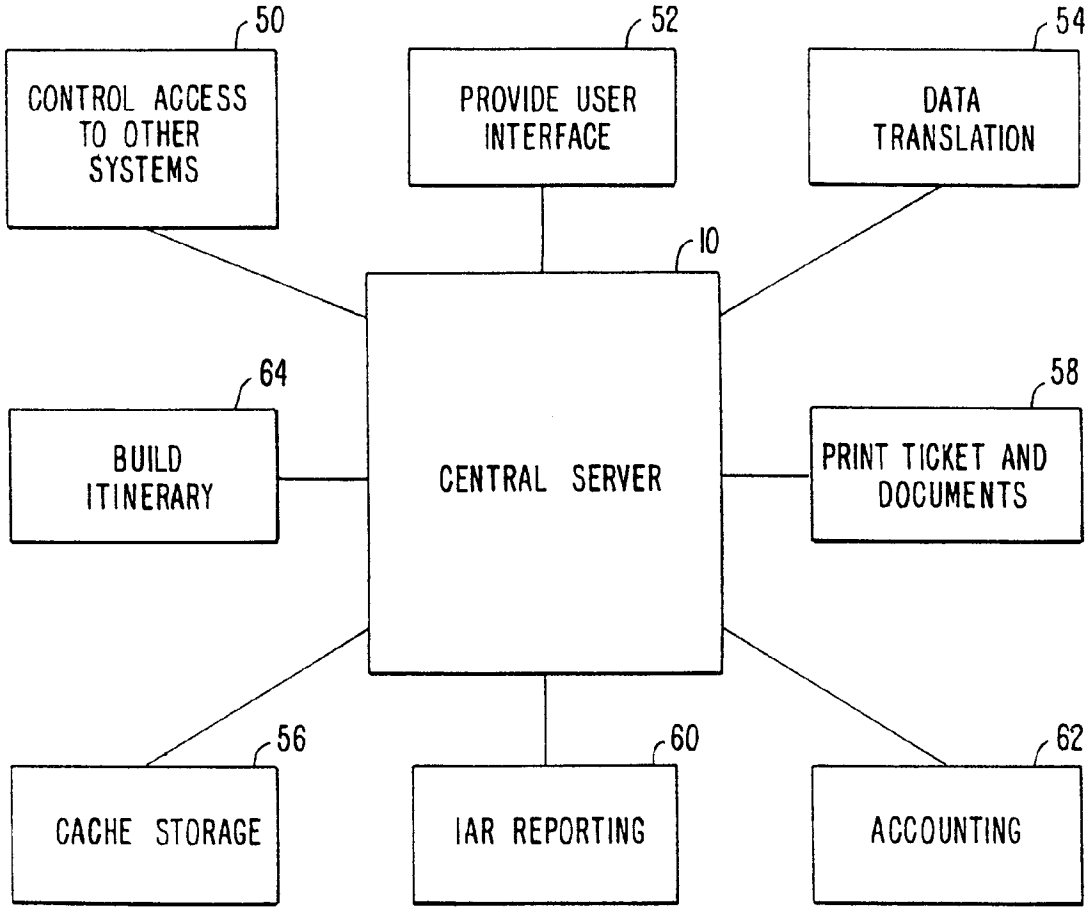
50
CONTROL ACCESS TO OTHER SYSTEMS
52
PROVIDE USER INTERFACE
54
DATA TRANSLATION
10
CENTRAL SERVER
64
BUILD ITINERARY
58
PRINT TICKET AND DOCUMENTS
56
CACHE STORAGE
60
IAR REPORTING
62
ACCOUNTING

FIG. 4.

GlobeRoamer Airline Reservation 2

Use this form to enter your trip.

Round Trip: [x]

Departure Date: [Jan] [1] [1999] [6am to 8 am]

Airport Orig: [Los Angeles]

Airprot Dest: [New York]

Return Date: [Jan] [8] [1999] [4 pm to 6pm]

# of Travelers: [1]

Reserve Car: [ ] Reserse Hotel [ ]

Add More Flight Segments: [ ]

Carriers: [(no preference)]

Flight Class: [Any]

Connections: [(no preference)]

[New Bookings] [Add a Flight] [ReCheck Last Request]

CRS Code
A01JANLAXNYC 600A
A*008JJAN0400P

FIG. 5.

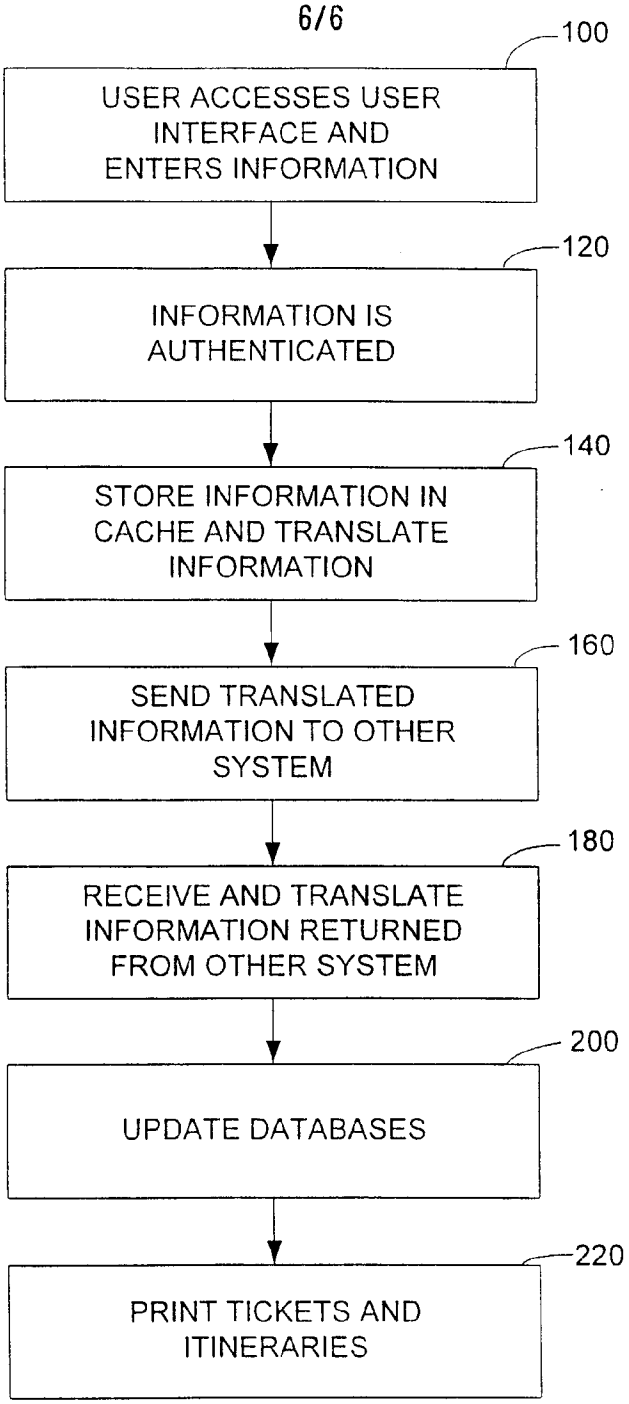
100
USER ACCESSES USER INTERFACE AND ENTERS INFORMATION
120
INFORMATION IS AUTHENTICATED
140
STORE INFORMATION IN CACHE AND TRANSLATE INFORMATION
160
SEND TRANSLATED INFORMATION TO OTHER SYSTEM
180
RECEIVE AND TRANSLATE INFORMATION RETURNED FROM OTHER SYSTEM
200
UPDATE DATABASES
220
PRINT TICKETS AND ITINERARIES

FIG. 6.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/05328

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :G06F 17/30
US CL :705/5, 6, 79

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 705/5, 6, 79

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,237,499 A (GARBACK) 17 August 1993 (17.8.93), Fig. 1, 3, Entire Document.	1-46
Y	US 5,832,451 A (FLAKE et al.) 03 November 1998 (3.11.98), Fig. 3, Entire Document.	1-46
Y	US AIRWAYS PERSONAL TRAVELWORKS WEB PAGES, "HTTP://WWW.USAIRWAYS.COM".	24, 41,46
Y	US 5,732,398 A (TAGAWA) 24 March 1998 (24.3.98), Fig. 2b, 2c, Entire Document.	1-46
A, P	US 5,953,705 A (ONEDA) 14 September 1999 (14.9.99), Entire Document.	1-46
A, P	US 5,978,770 (WAYTENA et al.) 2 November 1999 (2.11.99), Entire Document.	1-46

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 05 MAY 2000	Date of mailing of the international search report 06 JUL 2000
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer Emmanual Todd Voeltz Telephone No. (703) 305-3900

Form PCT/ISA/210 (second sheet) (July 1998)★

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/05328

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,253,166 A (DETTELBACH et al.) 12 October 1993 (12.10.93), Entire Document.	1-46
A	US 5,781,892 A (HUNT et al.) 14 July 1998 (14.7.98), Entire Document.	1-46
A	US 5,839,114 A (LYNCH et al.) 17 November 1998 (17.11.98), Entire Document.	1-46
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